Calculus Warm Up #11-5

1. Find $f'(x)$ for $f(x)=\dfrac{1}{x-e^x}$ $= 1(x-e^x)^{-1}$

$$f'(x) = -1(x-e^x)^{-2}(1-e^x)$$

$$= -\frac{1-e^x}{(x-e^x)^2}$$

$$= \frac{e^x-1}{(x-e^x)^2}$$

2. Differentiate $f(x)=x^{x^3}$

$$\ln y = x^3 \ln x$$

$$y\cdot\frac{1}{y}\frac{dy}{dx} = \left(x^3\cdot\frac{1}{x} + 3x^2\ln x\right)x^{x^3}$$

$$\frac{dy}{dx} = x^2(1+3\ln x)\cdot x^{x^3}$$

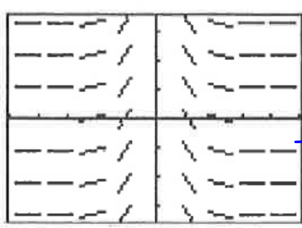
$$\frac{dy}{dx} = x^{x^3+2}(1+3\ln x)$$

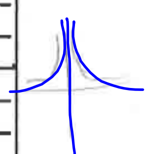
Back of the Slope Field WS

Match each slope field with the equation that the slope field could represent.

original

(A)

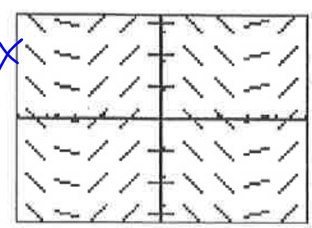




$y = \dfrac{1}{x^2}$

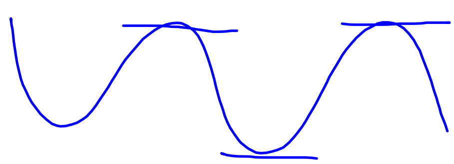
(B)

$y = \cos x$

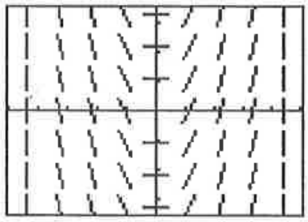


Notice slope $= 0$

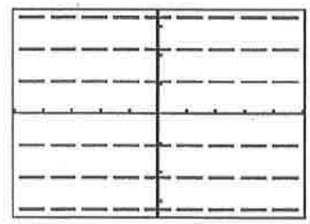
y-axis



(C)

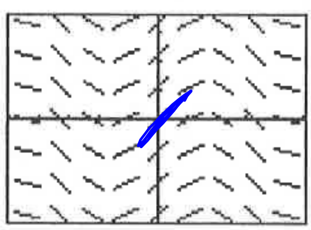


(D) all slopes = 0



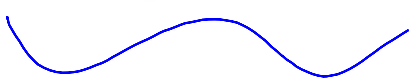
$y = 1$

(E)



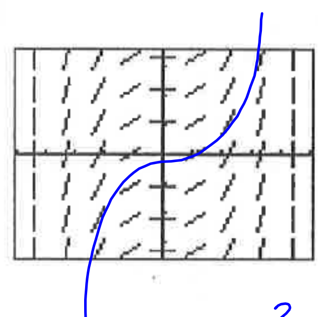
sin

Notice slope = 1 through y-axis



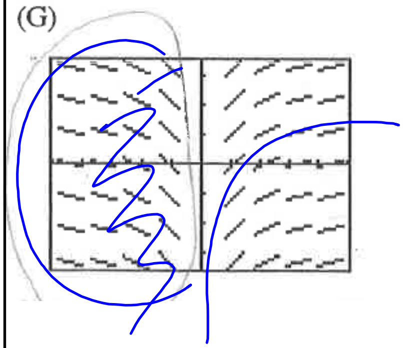
$y = \sin x$

(F)



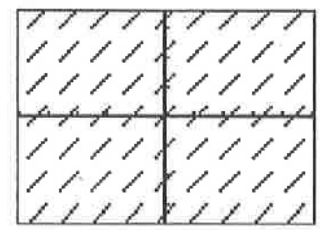
$y = \frac{1}{6}x^3$

(G)



$y = \ln|x|$

(H) all slopes = 1



$y = x$

From 4.9: Differentials and error propagation

$$\frac{dy}{dx} = f'(x)$$

dy is the differential of y
dx is the differential of x

$$\boxed{dy = f'(x)\,dx}$$

One use for differentials is to estimate the error that occurs when using physical measuring devices.

Example: The radius of a ball bearing is measured to be 0.7 inch. If the measurement is correct to ± 0.01 inch, estimate the propagated error in the volume of the ball bearing.

$\boxed{dy = f'(x)\,dx}$

Example: The radius of a ball bearing is measured to be 0.7 inch. If the measurement is correct to ± 0.01 inch, estimate the propagated error in the volume of the ball bearing.

$dr = \pm 0.01$

$-0.01 \leq \text{error} \leq 0.01$

$V = \frac{4}{3}\pi r^3$

$\frac{dV}{dr} = 4\pi r^2$

error in measurement

$dV = 4\pi r^2 dr$

propagated error

$dV = 4\pi(0.7)^2(\pm 0.01)$

$\approx \pm 0.0616$

You try:

The volume of a sphere is measured at 4 inches. If the measurement is correct to within .02 inch, use differentials to estimate the propagated error in the volume of the sphere.

HW:

Final Exam Rev WS #2